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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/597,976	08/15/2006	Peter-Andre Redert	NLO50010	8767

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BRIARCLIFF MANOR, NY 10510

EXAMINER

PERROMAT, CARLOS

ART UNIT

PAPER NUMBER

4147

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/597,976

Applicant(s)

REDERT ET AL.

Examiner

CARLOS PERROMAT

Art Unit

4147

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a). Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SF 298)
- Paper No(s)/Mail Date 05/30/2007.
- 4) ☐ Interview Summary (PTO-413)
- Paper No(s)/Mail Date ____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: ____.

DETAILED ACTION

Specification

1. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: Claim 17 is drawn to a “computer program product”, which is not defined within the specification. Appropriate correction is required.

Claim Rejections - 35 USC § 101

1. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claim 16 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claim 16 incorporates by reference the limitations of claim 1, which is drawn to a process, while the preamble of claim 16 is drawn to an apparatus. The applicant is advised to amend the claim in order to make a clear choice of statutory category, or to cancel the claim altogether.

Claim 17 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claim 17 is drawn to a “computer program product”, which is not a term that is restricted to a statutory category. Moreover, within the specification of the instant application, at par. [0081], the applicant describes that the software that might be used to execute the method disclosed may be loaded from a network, which uses signals encoded with the software. Because of the lack of restrictive definition, the “computer program product” encompasses these signals, which constitute non-statutory matter.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claim 16 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claim 16 makes a reference to “(...) receiving means (502) for receiving (...)”. Although the term appears in the specification, there is no clear discussion of what comprises the receiving means. The claim also mentions an element of figure 5, which is also identified as the receiving means, but, again, the drawing does not provide any information on what comprises said receiving means. As written, the claim encompasses all possible means for receiving signals.

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claim 4 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 4 recites the limitation "absolute difference" in the first line of the claim. There is insufficient antecedent basis for this limitation in the claim. The specification also uses the term but does not define it. For the purposes of compact prosecution the examiner will interpret the term to mean a difference.

6. Claim 16 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claim is drawn to an apparatus, but it incorporates all the limitations of claim 1. Claim 1 is drawn to a method. It is not possible to definitively ascertain towards which statutory category the claim is drawn.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1-4, 6, 8-10, 12, 13, and 15-17 are rejected under 35 U.S.C. 102(b) as being anticipated by Numagami et al. (Numagami, Y.; Kajiware, Y.; Nakamura, O.; Minami, T., Reconstruction of the 3-D shape of an object from a 2-D intensity image, Canadian Conference on Electrical and Computer Engineering, 1995. Volume: 2, 5-8 Sep 1995 Pages: 1188-1191, provided by applicant, "Numagami" hereinafter).

Regarding claims 1, 15, and 17, Numagami teaches a “method of generating a depth map (122) comprising depth values representing distances to a viewer, for respective pixels of an image (100)” (i.e., a method to reconstruct 3-D shape from a 2-D image, 1st par. of the Introduction, by calculating the heights of pixels, step 2 of section IV), “A depth map generating unit (401) for generating a depth map (122)” (i.e., a computer, see section V, par. 9), and a “computer program product” (inherently, since the method is performed by a computer) for “computing a cost value for a first one of the pixels (108) of the image by combining differences between values of pixels which are disposed on a path (112) from the first one of the pixels (108) to a second one of the pixels (110) which belongs to a predetermined subset of the pixels of the image” (i.e., two determine the height of a pixel from a fiducial pixel, where the fiducial pixel belongs to an isodensity line of pixels by combining the values of the pixels along a reconstruction path, section IV, steps 1-3); “and assigning a first one of the depth values corresponding to the first one of the pixels (108) on basis of the cost value” (i.e., assigning the height of the pixel by integrating the slope values of the pixels along the path, where the slope value is dependent on the intensity level of the pixels, section IV, step 2 (iii)).

Regarding claim 2, Numagami further teaches that “the predetermined subset comprises pixels which are located at a border of the image” (i.e., the predetermined subset of pixels belongs to an isodensity line of pixels, and this line is not restricted to pixels outside the border of the image, see section III, subsection *Extraction of the isodensity lines*, 1st par.).

Regarding claim 3, Numagami also discloses that “a first one of the differences is equal to a difference between respective values of neighboring pixels which are disposed on the path (112)” (i.e., the slope value of the pixels along the path, where the slope value is dependent on the difference of intensity between the pixels in the path, section IV, step 2 (iii)).

Regarding claim 4, Numagami further teaches that “a second one of the differences is equal to an absolute difference between respective values of neighboring pixels which are disposed on the path (112)” (see rejection for claim 4 in terms of indefiniteness of the term “absolute difference”, above, and the discussion for claim 3).

Regarding claim 6, Numagami further discloses that “the cost value for the first one of the pixels (108) is computed by accumulating the differences between the values of the pixels which are disposed on the path (112)” (i.e., the cost is calculated by integrating the slope value along the path, where the slope value depends on the difference in intensity value between the pixels in the path, section IV, step 2 (iii)).

Regarding claim 8, Numagami also teaches that “the cost value for the first one of pixels is computed by accumulating products of differences between the values of the pixels which are disposed on the path (112) and respective weighting factors for the differences” (i.e., the slope value is compensated by a product of a weight factor, see section IV, subsection *Calculation of the height*, 3rd par., and formula 12).

Regarding claim 9, Numagami further teaches that “a first one of the weighting factors which is related to a difference between a value of a particular pixel and a value of its neighboring pixel, is based on a distance between the particular pixel and the first one of the

pixels (108)" (see section IV, subsection *Calculation of the height*, 3rd par., formula 12, and Fig. 5).

Regarding claim 10, Numagami also discloses that "whereby a second one of the weighting factors which is related to a difference between a value of a particular pixel and a value of its neighboring pixel, is based on the location of the neighboring pixel related to the particular pixel" (i.e., the weight factor is based on the angle between the pixels, see section IV, subsection *Calculation of the height*, 3rd par., formula 12, and Fig. 5).

Regarding claim 12, Numagami also teaches "computing a second cost value for a third one of the pixels on basis of the cost value for the first one of the pixels" (i.e., linear interpolation used to fill areas between reconstruction paths, see section V, par. 7 and 8, and fig. 9).

Regarding claim 13, Numagami further teaches "computing the second cost value by combining the cost value of the first one of the pixels with a difference between further values of further pixels which are disposed on a second path from the third one of the pixels to the first one of the pixels" (i.e., linear interpolation used to fill areas between reconstruction paths, see section V, par. 7 and 8, and fig. 9).

Regarding claim 16, Numagami teaches an "image processing apparatus" (i.e., a computer, see section V, par. 9), "comprising: receiving means (502) for receiving a signal corresponding to an image (100)" (inherently, since the computer processes a 2-D image, which must have been received) "and a depth generating unit (401) for generating a depth map (122), as claimed in claim 1" (see rejection for claim 1, above).

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 5 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Numagami et al. (Numagami, Y.; Kajiwara, Y.; Nakamura, O.; Minami, T., Reconstruction of the 3-D shape of an object from a 2-D intensity image, Canadian Conference on Electrical and Computer Engineering, 1995. Volume: 2, 5-8 Sep 1995 Pages: 1188-1191, provided by applicant, "Numagami" hereinafter) as applied to claim 1 above, and further in view of Cahill et al. (U.S. Patent Publication No. 2004/0062439, "Cahill" hereinafter).

Regarding claim 5, Numagami also teaches that "the values of pixels correspond to one of luminance (....)" (i.e., the value of the pixel is the intensity of the pixel, section IV, step 2 (iii)). Numagami does not teach that the values of the pixels are measured in terms of color. Cahill however, also teaches a method of generating a depth map, see par. [0018], in which the pixel values are measured in terms of luminance, or alternatively, chrominance, see par. [0746].

Because both Cahill and Numagami teach methods of creating depth maps from a 2-D image, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the pixel evaluation of luminance in Numagami with the alternative evaluation of chrominance taught in Cahill because in luminance measurements, the level of white for every pixel is measured. In chrominance measurements, the levels of the color components are

measured. These techniques are equivalent, one applying to grey-level pictures, and the other to color pictures, and well-known in the art.

Regarding claim 7, Numagami discloses that "the cost value for the first one of the pixels (108) is computed by accumulating the differences between the values of the pixels which are disposed on the path (112)" (i.e., the cost is calculated by integrating the slope value along the path, where the slope value depends on the difference in intensity value between the pixels in the path, section IV, step 2 (iii)). Numagami does not teach "the differences being larger than a predetermined threshold". Cahill however, also teaches a method of generating a depth map, see par. [0018], in which the pixel values are adjusted to meet a predetermine threshold, see par. [0016].

Because both Cahill and Numagami teach methods of creating depth maps from a 2-D image, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the pixel evaluation of intensity in Numagami with the threshold evaluation taught in Cahill in order to diminish the error caused by noise within the 2-D image, as disclosed by Cahill, see par. [0033].

11. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Numagami et al. (Numagami, Y.; Kajiwara, Y.; Nakamura, O.; Minami, T., Reconstruction of the 3-D shape of an object from a 2-D intensity image, Canadian Conference on Electrical and Computer Engineering, 1995. Volume: 2, 5-8 Sep 1995 Pages: 1188-1191, provided by applicant, "Numagami" hereinafter).

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Regarding claim 11, Numagami teaches “computing a second cost value for the first one of the pixels (108) of the image by combining differences between values of pixels which are disposed on a second path (202) from the first one of the pixels (108) to a third one of the pixels (204) which belongs to the predetermined subset of the pixels of the image” (Numagami teaches that its method is performed for every one of the fiducial points found, see section IV, step 3, where a fiducial point is a point of an isodensity line, see section IV, step 1, and there is a plurality of isodensity lines, see fig 2). Numagami does not teach “determining the minimum of the cost value and the second cost value; assigning the first one of the depth values corresponding to the first one of the pixels (108) on basis of the minimum”. Although Numagami is silent about how to resolve conflicting cost values for the same pixel, where the cost values have been calculated along the different paths between this pixel and fiducial points in adjacent isodensity lines, the examiner takes the official notice that, where two or more conflicting measurements for a unique value are found, there are a limited number of choices on how to solve said conflict. Therefore it would have been obvious for one of ordinary skill in the art to modify the method disclosed in Numagami, with a choice of the minimum value when two or more conflicting values are found for the same measurement to resolve this conflict by either choosing the larger value, the lower value or the average value. Arriving at the conclusion that the minimum value is more likely to be correct would have come naturally to one of ordinary skill in the art at the time of the invention after normal testing of the method, if, for example, it was found that the most frequent error in measurement is to overestimate the value for a point

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Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Numagami et al. (Numagami, Y.; Kajiware, Y.; Nakamura, O.; Minami, T., Reconstruction of the 3-D shape of an object from a 2-D intensity image, Canadian Conference on Electrical and Computer Engineering, 1995. Volume: 2, 5-8 Sep 1995 Pages: 1188-1191, provided by applicant, "Numagami" hereinafter) as applied to claim 12 above, and further in view of Nakatsuna et al. (U.S. Patent Publication No. 2002/0154116).

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Regarding claim 14, Numagami also teaches that "cost values corresponding to respective pixels of the image are successively computed on basis of further cost values being computed for further pixels" (i.e., pixel values are calculated by linear interpolation of neighboring pixels, see section V, 8th par.). Numagami does not teach "a first scan direction of successive computations of cost values for a first row of pixels of the image being opposite to a second scan direction of successive computations of cost values for a second row of pixels of the image". Nakatsuna, however, teaches a method of interpolating depth values on a pixel-by-pixel basis (see par. [0119] and [0165]), in which the pixels are evaluated in a zigzag path, so that pixels may be positioned in a two-dimensional neighborhood (see par. [0179]).

Because both Numagami and Nakatsuna disclose linear interpolation for calculating pixel values, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the linear interpolation of depth values as disclosed in Numagami, with the zigzag inspection path disclosed in Nakatsuna. Such an approach would be representative of the well known principle of locality in program optimization, by which it is advantageous to perform

tasks in such an order that the values that have just been calculated and are therefore readily available, are those needed to perform the next calculation.

Conclusion

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to CARLOS PERROMAT whose telephone number is (571) 270-7174. The examiner can normally be reached on M-TH 8:30 am- 5:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kieu-Oanh Bui can be reached on (571) 272-7291. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

| /KIEU-OANH BUI/
Supervisory Patent Examiner, Art Unit 4147

CARLOS PERROMAT
Examiner
Art Unit 4147